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Briefly stated, the life history is as follows : The insect winters in the larval stage, freezing and thawing as often as need be during that season. It pupates late in May and becomes adult a week or ten days later. Eggs are laid in the leaves singly or in small groups ; fastened to the sides or floating on the surface. The summer broods mature in about a month, and there are probably three if not four series ; but the broods overlap so much that the breeding is practically continuous. Late in the season the adults select the new leaves for oviposition even if they are yet dry.

There is little difference in appearance between the sexes and the antennæ of the male are hardly plumose.

In New Jersey the larvæ breed in the leaves of *Sarracenia purpurea* only ; but not everywhere, for Mr. E. L. Dickerson, who examined a large number of plants for me in Morris County, says positively that there are no mosquito larvæ in any of them. Whether exceptionally or normally, the water in the plants examined by him was foul, and in such a mixture this larva does not live. On the other hand, Mr. D. W. Coquillett tells me that he has the species from Florida, where it breeds in the leaves of an orchidaceous plant growing on trees.

This is the Jersey mosquito for which I claim that it does not bite !

NOTES ON THE LIFE-HISTORY AND HABITS OF ONCIDERES TEXANA.

BY GLENN W. HERRICK.

While inspecting nurseries in Biloxi and Ocean Springs, Mississippi, the writer noted that the branches of many pecan trees in the nursery rows were cleanly severed as though by some insect, probably a beetle. On further investigation a puncture in the bark just beneath every bud on the severed portion was evident. In the majority of these punctures was found a minute egg, from which the larvæ and pupæ of *Oncideres texana* Horn, have been reared and observed for nearly two years.

Mr. James Brodie of Biloxi, has aided me greatly in observing the habits of the adults and in sending me material. I shall frequently quote Mr. Brodie's own words.

So far as the writer is aware nothing has been recorded in regard to the life-history of this beetle.

Dr. Riley has contributed several short articles to the American Entomologist on *O. cingulata* which however are incomplete and hence the following notes may be of interest.

Eggs.—These were imbedded between the bark and wood in perforations made by the female beetle. The opening was closed by a gummy secretion. The eggs are about two and one half millimeters in length, of a whitish color, and oval in shape. Those under observation were laid in October of 1900 and hatched in about one month. The time of hatching is not definitely known because we were anxious to rear the adults and so did not like to examine the eggs and thus destroy them. Each egg is laid beneath a bud and rarely beneath a small branch if it be not more than one year old.

In every case coming under my observation or that of Mr. Brodie, a peculiar scarring of the bark from the egg down the branch for two or three inches was found. The female, after laying her eggs, digs with her mandibles, transverse shallow grooves one-sixteenth to one-eighth of an inch long in the bark, along the probable course of the burrowing larva. These grooves are close together and give to the bark its peculiar scarred appearance. No doubt it is done to deaden the bark and prevent growth from crushing the egg. Where an egg is laid beneath each bud, the series of grooves often extend from bud to bud. Thus the whole severed portion may be scarred. Dr. Riley mentions nothing of the kind in regard to *O. cingulata*, and we conclude that the species differ in this particular.

So far as observed the eggs are laid only in the severed portion of the branch and I should expect this to hold true in every case.

Larvæ.—These are white in color and from one-half to three-fourths of an inch long. They vary much in size. In the first place, I judge those destined to produce females are larger than the others. In the second place a difference in the amount of nutriment obtained, no doubt has something to do with the variation.

When looked at with a lens the body is found to be sparsely clothed with very short, dark, hairs. The mouth parts are black and protrude. After hatching they soon burrow a little distance into the wood and remain there until warm weather. During the following spring and summer they excavate galleries in the dead branch just beneath the bark. Occasionally one is found burrowing in the solid

wood. They grow rather slowly and apparently little wood satisfies them. In one branch, three-eighths of an inch in diameter, two larvæ came to maturity in galleries not over five inches long. Of course the two galleries occupied nearly the whole branch, only the thin bark and a thin partition wall remaining.

The larvæ exist in these cut-off branches one year in most cases and then pass into the pupal stage within the gallery. Some larvæ certainly pass another winter in the branches. These are evidently those that for some reason have not grown rapidly, owing possibly to insufficient nutriment. Among several branches examined in January, 1902, two larvæ were found that had not changed to the pupal form. They were not over two-thirds grown and most certainly will remain as larvæ until warm weather.

Before the larva changes to a pupa, it cuts a pinhole in the bark near the end of the gallery, and closes up the opening of the burrow behind with long thread-like shavings. The pupal cell is thus furnished with an opening to the outside for air and egress when the proper time comes.

Pupæ.—On account of my intense desire to obtain the adults, the larvæ were disturbed as little as possible and consequently the exact time of change to the pupal form is not known. It was some time between October 12 and November 12, 1901. On the former date, two were examined and found still in the larval state. On the latter date they were pupæ. This gives approximately one year in these two cases for the development of the larvæ.

The pupæ are also white with short dark-colored spines on the dorsal sides of segments. They vary from seven-sixteenths to five-eighths of an inch in length and lie in burrows in most cases as described above until some time during the following summer. The pupæ under observation at this time, January, 1902, developed from eggs laid in October, 1900, have not changed to the adult form with one exception, and can hardly be supposed to do so until warm weather. The one exception noted was the case of a pupa that had attained the adult form in the autumn but for some reason was not able to issue from its cell and died. So it is possible that in some cases one year may complete the life-history.

In October of this year I found many larvæ in branches of oak and the adults were then depositing their eggs in a tree near by. This fact puzzled me at the time but when I learned that the pupæ lived

over another season it became plain that these were the adults of last year's larvæ.

Adults.—These are grayish beetles from one-half to five-eighths of an inch long. The male is the smaller and has longer antennæ. The antennæ of the female are only slightly longer than the body while those of the male are considerably longer. The wing covers are marked with irregularly roundish, red spots. The middle third (approximately) of each wing cover is rather densely clothed with gray hairs which give this part a distinctly grayish appearance. The proximal (especially) and the distal thirds are less densely clothed, hence darker in color. The thorax is light gray but the vertex of head and face are covered with reddish hairs.

Habits of Adults.—It is evident from continued observation that these beetles almost invariably work in pairs. Mr. Brodie says: "The result of further observations keeps me convinced that they work in pairs. The male is the smaller, and the fact that I frequently find them copulating proves they are in pairs. If the male is not in company with the female he is not far away. I invariably find him at the point or base of the branch the female is sawing. She takes frequent intervals of rest and then they are together and frequently while the female is at work the male is there but in no sense helping or interfering in the work. I have found solitary females working but it was the exception." The female does all the work. After she selects a branch, she stands on it head downward and clasps it firmly with the fore legs. The manner of cutting is described by Mr. Brodie as follows: "In starting work, a patch the desired width of cut is cleaned and the bark eaten. Then the powerful mandibles are brought to work on the wood. A cut is first made at the top, then the head moves gently down to the bottom, where a corresponding cut is made; then working from the bottom cut, the wood fiber is raised and as the piece was cut free to start with at the top it is already detached when the piece is torn loose to the top cut. Then another cut is made at the top; then at the bottom, and so on till the insect reaches in as far as it can conveniently. It then moves to either side of this cut, eats off another strip of bark and goes to work on the wood as before."

Strange to say the cutting in all actually observed cases is done before the eggs are laid. Sometimes enough wood is left to support the branch but often it falls over before the eggs are deposited. This cutting off of the branch is evidently to prevent growth from crushing

the eggs and to provide suitable food for the larvæ. In one case where sufficient wood was left for circulation of sap, the eggs were found crushed between the bark and wood.

Dr. Riley infers that the twigs are cut off by *O. cingulata* to keep them on the damp ground where the eggs will remain moist. In the case of *O. texana* I found several branches containing one-year-old larvæ that had lodged in the branches of a thick bushy oak from which they had been cut. These were healthy vigorous larvæ and changed to pupæ later. Of course these larvæ had never touched the ground.

History of a Single Pair.—During the autumn of 1901, Mr. Brodie had the good fortune to be able to observe continuously day by day the work of a single pair and the report is here given in his own words. "Possibly the work started September 28th. I found them November 5th. Then three branches had been cut. Day by day the work went on. The trees they selected were in a nursery row—three-year-old pecans. Nearly all the eggs were deposited in the two-year-old wood. The whole season's work was limited to an area of twenty-five feet by four feet. Six trees were used and, from these, nineteen branches were cut. In the nineteen branches I counted a deposit of one hundred and fifty-seven eggs. These insects remained in company over three weeks. Then the male disappeared and no other returned. Possibly his season of usefulness was passed or he met an enemy. One feature that taxed my patience, was their selection of the best budded trees in preference to the seedling trees standing with them in the same row. December 15th we had a sharp freeze and I surmised that her life work might be ended. Sure enough I found her near the root of the tree on the ground frozen stiff. I held her some time in my warm hand but there was no recovery. Then I held her in my clasped hands and breathed on her 'the breath of life,' and she once more became a living beetle. I left her as comfortable as possible but the shock was too great for her recovery. December 16th we had 14° to 16° freezing and that morning I found a dead beetle."